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Performing Quality Flow Measurements at Mine Sites

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Performing Quality Flow Measurements at Mine Sites

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NOTICE

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FOREWORD

The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory is the Agency's center for investigation of technological and management approaches for preventing and reducing risks from pollution that threatens human health and the environment. The focus of the Laboratory's research program is on methods and their cost-effectiveness for prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites, sediments and ground water; prevention and control of indoor air pollution; and restoration of ecosystems. NRMRL collaborates with both public and private sector partners to foster technologies that reduce the cost of compliance and to anticipate emerging problems. NRMRL's research provides solutions to environmental problems by: developing and promoting technologies that protect and improve the environment; advancing scientific and engineering information to support regulatory and policy decisions; and providing the technical support and information transfer to ensure implementation of environmental regulations and strategies at the national, state, and community levels.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

E. Timothy Oppelt, Director
National Risk Management Research Laboratory

ABSTRACT

Accurate flow measurement data is vital to research, monitoring, and remediation efforts at mining sites. This guidebook has been prepared to provide a summary of information relating to the performance of flow measurements, and how this information can be applied at mining sites. Information presented in this guidebook includes the theory, methods, selection criteria for these methods, and quality assurance/quality control (QA/QC) guidance for performing flow measurements at mining sites.

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LIST OF ACRONYMS

ADCPs	Acoustic Doppler Current Profilers
ADVs	Acoustic Doppler Velocimeters
AVM	Acoustic Velocity Meter
BMPs	Best Management Practices
BOR	Bureau of Reclamation
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	Cubic Feet per Second
cms	Cubic Meters per Second
CWA	Clean Water Act
EGL	Energy Grade Line
EPA	U.S. Environmental Protection Agency
FSs	Feasibility Studies
ft/s	Feet per Second
ft^2	Square Feet
gpm	Gallons per minute
HGL	Hydraulic Grade Line
l/s	Liters per Second
LDVs	Laser Doppler Velocimeters
LiBr	lithium bromide
MDLs	Method Detection Limits
MWTP	Mine Waste Technology Program
NaBr	Sodium Bromide
NaCl	Sodium Chloride
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRCS	U.S. Natural Resource Conservation Service
NRMRL	National Risk Management Research Laboratory
QA	Quality assurance
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control

LIST OF ACRONYMS (continued)

RI/FS	Remedial Investigations/Feasibility Studies
RIs	Remedial Investigations
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SCS	Soil Conservation Service
SME	Society of Mining Metallurgy and Exploration
TMDL	Total Maximum Daily Loads
USGS	United States Geological Survey